Appendix G

Preliminary Protection Requirements

CINERGY BULLARD ENERGY CENTER PROJECT

SYSTEM IMPACT STUDY

PRELIMINARY PROTECTION REQUIREMENTS

EDRO: JUNE 2008

PROTECTION REQUIREMENTS

The Protection Requirements will consist of replacing the existing line protection and carrier equipment at Kearney and Herndon. The Herndon – Bullard EC 230kV Line will have a fully redundant, double-pilot current differential scheme utilizing dual fiber optic communications. The Bullard EC – Kearney 230kV Line will utilize a two terminal carrier scheme. The details are as follows:

COMMUNICATIONS

I. Fiber Optic Links:

A. Install dual redundant fiber optic cables between Herndon substation and Bullard EC Facility.

HERNDON SUBSTATION

I. CB 232: Herndon – Bullard EC 230kV Line

A. Line Length: **Approx 1.6 miles**

B. Remove existing line protection.

C. Install G.E. L90 SET A current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.

D. Install SEL 311 L SET B current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.

KEARNEY SUBSTATION

I. CB 212: Bullard EC - Kearney 230kV Line

A. Line Length: **Approx 9.2 miles**

B. Remove existing line protection.

C. Install G.E. D60 SET A relay as one terminal of a two-terminal carrier scheme on power line carrier.

D. Install SEL 311 C SET B relay as one terminal of a two-terminal carrier scheme on power line carrier.

E. Evaluate existing Wave Trap.

F. Install Pulsar TCF-10B power line carrier transceiver for frequency shift keying scheme.

G. Reference and apply Borden drawing # 4040518, 4040519, 4040520 and 4040521 where appropriate.

BULLARD EC SUBSTATION

I. CB AAA/BBB: Herndon – Bullard EC 230kV Line

A. Line Length: **Approx 1.6 miles**

B. CB AAA: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.

C. CB BBB: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.

D. All CTs to be pulled into the control room.

E. Install G.E. L90 SET A current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.

1. Wire to outermost Bus-side CT of CB AAA and CB BBB.

F. Install SEL 311 L SET B current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.

1. Wire to innermost Bus-side CT of CB AAA and CB BBB.

G. Install three (3) line-side CCVTs to provide polarizing potentials for line protection and station automatics.

H. Install one (1) bus-side CCVTs to provide synchronizing potential for station automatics.

II. CB BBB/CCC: Bullard EC - Kearney 230kV Line

H. Line Length: **Approx 9.2 miles**

I. CB CCC: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.

J. All CTs to be pulled into the control room.

K. Install G.E. D60 SET A relay as one terminal of a two-terminal carrier scheme on power line carrier.

1. Wire to outermost Bus-side CT of CB BBB and CB CCC.

B. Install SEL 311 C SET B relay as one terminal of a two-terminal carrier scheme on power line carrier.

1. Wire to innermost Bus-side CT of CB BBB and CB CCC.

C. Install Wave Trap with 200-400kHz tuning range.

D. Install Pulsar TCF-10B power line carrier transceiver for frequency shift keying scheme.

E. Install three (3) line-side CCVTs to provide polarizing potentials for line protection and station automatics.

F. Install one (1) bus-side CCVTs to provide synchronizing potential for station automatics.